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Standards Residential and	)	NOTICE OF WORKSHOP
Nonresidential ACM Reference	)	RE: 2019 Draft ACM
Manuals and Compliance	)	Reference Manuals and
Software Updates	)	Compliance Software
_____	)	Updates

NOTICE OF PUBLIC WORKSHOP
2019 BUILDING ENERGY EFFICIENCY STANDARDS
RESIDENTIAL AND NONRESIDENTIAL
ALTERNATIVE CALCULATION METHOD REFERENCE MANUALS
AND COMPLIANCE SOFTWARE TOOLS

THE WARREN-ALQUIST STATE ENERGY BUILDING
ART ROSENFELD HEARING ROOM - FIRST FLOOR
1516 NINTH STREET
SACRAMENTO, CALIFORNIA 95814

WEDNESDAY, FEBRUARY 13, 2019

9:00 A.M.

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I N D E X

P R O C E E D I N G S

JANUARY 13, 2019 9:02 a.m.

MR. FROESS: Welcome to the 2019 Alternative Calculation Methods Reference Manual and Software Update Workshop. I just want to an introduction here. Welcome, my name is Larry Froess. I'm a Senior Mechanical Engineer with the Energy Commission and also the Project Manager for CBECC-Com. Also here is Todd Ferris. He's our Software Unit Tools Unit Supervisor. So between us and the rest of the staff it makes it work. Also, I have Roger Hedrick here, with NORESCO. He's one of the consultants that helps with the alternative calculation methods work.

For a little bit of housekeeping, if there is an emergency and we need to evacuate the building, please follow the staff to the Roosevelt Park, which is diagonally across the street here. If you need to use a restroom there's some right outside the door around the corner there. And we have a snack bar up the stairs to the right, up that way.

And just to let everybody know the workshop is being broadcast with WebEx and it is going to be recorded and we ask that all the participants present sign in on the sign-in sheet. And for those that are on the WebEx online you're going to remain muted during the process. And then we're going to have a comment period, where if you'd like

to make a comment raise your hand and our WebEx operator will unmute you and you can ask your question.

We're going to start with the people in the room first for comments and then we'll go online and address you alphabetically.

Here's a quick agenda of the workshop. I'll do a quick overview of the ACM Manual and the software. Then I'll go through the envelope, lighting and HVAC. Then we'll stop and have a questions and a public comment period and a break. And then after that, we'll cover the covered process, water heating, some miscellaneous items and we'll have a final comment period if there's some questions and answers. And then when we're all done we'll have a conclusion and adjournment.

So I'll just get started here. So a quick overview of what the ACM process is or what it is, the Alternative Calculation Method. And basically it defines what the standard design will be for a performance model. When you input your proposed features, it'll automatically create a standard model based on prescriptive requirements. And there's also some features that aren't in prescriptive requirements such as like HVAC schedules, occupancy schedules, HVAC performance curves and some pumping power etcetera.

It also provides a set of software tests, which

is known as a reference method that will set the criteria for software, to test themselves too if they want to seek approval to be used to show Title 24 compliance.

And then also part of that ACM reference set is appendices and they're listed there on the screen. And these define the space use data, the occupancy schedules, construction data and performance curves of various HVAC equipment.

The ACM also specifies the input restrictions for a proposed design. It'll limit, make sure you don't input something below minimum mandatory equipment efficiencies or go higher than like 100 percent of a glass on a wall. So it does have some input restrictions that it makes sure the model is realistic. Every input that is done on the proposed will create a standard design input as well. So it's going to automatically create a standard design model in the software.

Some of the inputs are fixed for both the baseline and the proposed model such as set points, temperature set points, equipment set points, schedules, design, occupancies, etcetera. There are some neutral inputs that vary, but the baseline will match it and track it like a sliding scale such as a window-to-wall ratio when you're less than 40, the building geometry surface areas, and the space type use. And then there's variable inputs

that are allowed to vary in the proposed design that you can get some compliance or a penalty if you're over the prescriptive allowance such as lighting power density, equipment efficiency, U-Factors and pump power, for example.

And some mandatories are not modeled, mandatory measures. Those are things such as refrigerator warehouses, outdoor sign and lighting controls, etcetera. They're just not modelable.

So the performance method is an alternate method to show compliance. You can use the prescriptive method as well. But sometimes if you're proposed design doesn't meet prescriptive requirements then you can opt to use the performance method. And this would allow you to trade off certain features that wouldn't be allowed, prescriptively. So if you have higher window-to-wall ratio than prescriptively allowed then you can trade it off with a better envelope or lower lighting power, etcetera.

The goal also is that it's a fair method to ensure minimum compliance that the CEC is striving to reach. So the prescriptive requirements are what the standards are based on. And the standard design model of the software uses the prescriptive requirements to meet that baseline. And that's what we're striving to meet.

The secondary goal is also for modeling of

alternate designs that are not specified in Title 24, Part 6, such as chill beams, thermal energy storage and new features that we're constantly striving to get into the software.

The software, CBECC-Com, there's two different flavors. One of them is detailed geometry. This is where you can use different software inputs to create your geometry. We offer a free sketch-up version where you create your geometry, 3D geometry, in there and it imports it into CBECC-Com and gets modeled through OpenStudio, EnergyPlus, and does the simulation. The benefit of that is it actually is, as you can see in the diagram, the software actually models the geometry and orientations with poly lines and surfaces that touch and in a certain orientations. And the benefit is the software will allow for daylighting, like true daylighting performance and you can get building shading such as that one where it's a U-shaped building. As the sun travels throughout the day, it'll shade the various parts of the building and the performance affects it.

The simplified geometry model doesn't do that. And you can see in that lower right picture that's what the software does with this. It just kind of jumbles it all in one axis. And it just goes into the software as geometry with certain orientations, but doesn't take advantage of

the building shading or daylighting.

So we'll start with the envelope changes. This is what the standards have done that will affect the standard design baseline. So to start the envelope there really hasn't been any substantial changes for the envelope. Going from 2016 to 2019, there weren't many values that were updated for the envelope. However, a new feature was added for daylighting controls, which I'll get into on the next slide. Essentially, this will allow for clerestory credits. If you have a horizontal slats or light shelves. And that'll apply a power adjustment factor, which essentially helps reduce the proposed lighting that acts as a credit.

We've also improved some of the modeling approaches. And one of them, for example, is we can now model a double stud or a staggered stud metal stud wall. So it basically allows you to model two composites in the software, where before it only limited you to one.

And there's also a new treatment in the standards, which is for health care facilities. They are now required to comply with certain portions of the standards. And I will address them at every topic in the slides here. And so essentially for the envelope the healthcare facilities are required to comply with the envelope requirements of the standards.

Lighting in the software was updated to match the tables of 140.6. Along with that there is a lot of new primary function areas. I believe it's lining up with ASHRAE categories. And in the software it's called a space function. So you're now selecting a space function, which helps define the lighting category.

And as I mentioned before there's also some advanced daylighting options for credit. It's the clerestory horizontal slats and light shelves. If you model them in the simplified geometry you just select the power adjustment factor you're modeling and it will apply the credit automatically. If you're using the detailed geometry model it will automatically detect if you have a clerestory, based on the definition in the standards. And it'll simulate the actual daylighting and energy savings performance of that 3D model. And it also allows you to combine multiple power adjustment factors as defined in the standards. And the healthcare facilities are also required to comply with lighting.

Here's just a -- I know this is small, but when you can -- you can look at this offline. Those three highlighted power adjustment factors are the new ones. There's a clerestory, which would essentially reduce five percent off of your proposed lighting. The horizontal slats would reduce another 5 percent. And the bottom one

is a light shelf and if that's installed per the standards, you can get a 10 percent reduction in the lighting. And you're allowed to combine the clerestory and the light shelf. If done properly, you can get a 15 percent reduction.

For the HVAC one of the big updates is the ventilation. We added more categories, again lining up with ASHRAE. And so now in the software we're actually picking -- within each space category, there can be multiple choices for the ventilation categories. And so, that's a new feature in the software as well. And we'll show that on the next slide that you pick, a vent function for each space that you're defining.

There's also now a new exhaust ventilation requirement in the standards. The software accounts for that and it will know, based on the space type if exhaust ventilation is required or not.

Part of the standards too is also an air classification that prohibits certain classifications of air being transferred to other spaces. Software is not enforcing that, so the designers will have to make sure that their designs meet the standards.

High-rise residential is another ventilation update. That is being based on the ASHRAE 62.2 methodology. And it looks at the number of bedrooms and

calculates how many people there are from that, along with the floor area.

Also new to the '19 is it no longer allows operable windows or natural ventilation for ventilation. It has to be controlled ventilation and that can either be done by a supply-only based system, exhaust-only system or a balance system. To help projects that are using ventilation standards that aren't necessarily part of Title 24, Part 6 such as an OSHPD or ASPCAs or ANSI we added a feature in the software that allows you to override the Title 24-required ventilation rates. And it'll ask you to indicate what agency or standard you're using. It'll report that on the PRF-01. And when that's done the standard design will essentially match the proposed rate. But one thing to keep in mind is make sure that the system -- the proposed system is sized properly to handle this excess of outside air otherwise it'll be an undersized equipment.

Healthcare for the ventilation rate is exempt from the Title 24 Part 6, but is required to follow with the California Mechanical Codes Chapter 4. And in the software the standard design will match the proposed rate.

Here are some screenshots of this, what I was talking about. So the high-rise ventilation is on the left. That's where you'd input how many one bedroom units,

two bedroom, three bedroom, etcetera, and their square footages. And then from there it'll calculate the ventilation required for those spaces.

The other ventilation is on the top right. So you pick the ventilation standard as another, and then that description box opens up and you just type in whatever agency or specification you're following. And that’s what will indicate to the software to the standard design will match the proposed.

And then that bottom right is the healthcare space. That's a new checkbox. And this is what allows the user to indicate is the space a healthcare space or not? There's also seven pre-defined space functions that will automatically check that box. And that's straight from the standards.

There's also transfer air limits for exhaust air makeup. The software has maximum and minimum limits that will allow for the transfer air to move, based on a per floor basis. And it also allows spaces without dedicated ventilation supplies to have outside ventilation treated. And again, it looks at it on a per floor basis.

A change from the 2019 Standards is the mechanical system shutoff, which is known as the window interlock. Subsection 140.4(n), has been updated to now it only applies to nonresidential buildings. High-rise

residential projects are exempt and healthcare facilities are exempt from that.

One of the big changes that we've done in the 2019 ACM is we've revised the HVAC system map. It's kind of hard to see in this, but again if you look at them offline the information is there. One of the first ones we did was for the residential, high-rise residential and hotel/motel. Previously every level was based on a four-pipe fan-coil system, which was a chiller, cooling tower and a boiler, with hydronic piping. So we've adjusted it now to seven floors and less. The baseline will be a single zone AC, which is a DX air conditioning and a gas-fired furnace and that's an individual per unit. Once you go above eight floors, then it changes back to the four-pipe fan-coil.

Another change is we've added a retail-building category. And essentially the baseline will switch to that and it's a single zone VAV with an asterisk. And I'll get to that asterisk in a second. And so essentially if the majority of the floor is retail space then the baseline will assume that category.

What the asterisk is, is a single zone VAV would indicate that it's a variable air volume package system. So if you have a three-ton load, your baseline is going to be compared against a single zone VAV. So we revised that

to follow the California standard requirements of when a single zone is allowed and when it's not. And so we drew the line at if it's less than 65,000 BTUs of cooling then it will become a constant volume system just like your regular constant speed package unit. And in addition, if you're less than 54,000 Btus of cooling you don't require the economizer as well.

So that also helps with the previous category that used to be problematic when you had buildings less than 10,000 square feet and two stories or less, you're always compared against that VAV system. But we've changed that in that Table 3, the very first one. There's now less than 25,000 square feet, less than three floors, that is also a single zone VAV with that asterisk. So that'll help for the smaller projects that a regular constant volume unit would be more cost effective for it. And we've also revised that Table 3 to reflect more closely to the ASHRAE 90.1 Appendix G system maps.

And this is just more descriptions of what each of the systems are. Single zone AC is a DX cooling with a gas furnace, etcetera. This is just on here for reference, that can be looked at offline.

We've updated the fan system power to the Standard Section 140.4(c) when the nameplate horsepower exceeds five horsepower. It essentially is coming from

ASHRAE exhaust fan power. And it's using the limit based on what the standards say. And the exhaust fan power, in the standard design will be proportionate to the total fan power of the entire system. The standard design system uses relief fans only. And the fan power adjustments are also available in the ACM and the software for that Table 140.4(b). And there's various ways to select them in the software when the correct model is modeled on with the correct space types.

We've updated the cooling tower efficiency as well. This applies when it's an axial fan open circuit-cooling tower serving a chilled water plant. So when the total condenser water flow is 900 gpm or greater, the standard design will go to a 60 gpm per horsepower, for climate zones 2 through 15 and in climate zones 1 and 2 -- or 16, I'm sorry, it'll go to 42.1 gpm per horsepower and in any climate zone, when it's less than 900 gpm.

Healthcare facilities have a special treatment for HVAC, where they are exempt from all of the space conditioning requirements. But they still have to meet the minimum efficiency requirements for the equipment. When a healthcare is selected, as I previously showed when the checkbox is checked, the standard design essentially matches the baseline -- the proposed mode.

And in order for that to work out right the air

systems and the thermal zones must only contain healthcare spaces. Because that's the only way the software can exempt the air handling systems, rather than being compared with the prescriptive requirement. So it's essentially they have to be modeled as a dedicated HVAC system.

Again, and another new feature we're implementing now is the variable refrigerant flow or VRF equipment for compliance. We've had a research version out for over a year just to test the waters. And so, for 2019 we're going to allow it to be used for compliance. Essentially, we model the inputs -- or actually so our VRF is a single outdoor condensing unit with multiple indoor units. There's various inputs that go along with the system such as the air temperature, cooling capacity, heating capacity, efficiencies, etcetera. And the outdoor unit, you have some inputs on that as well.

We based the performance curves on the Florida Solar Energy Center Report that was done a few years ago that was supported by the Department of Energy. And just a reminder too is that the standard design is still based on an HVAC system map.

Here's a screenshot of the VRF input tab of the various inputs that are required for it to run.

And unmet load hours is another topic. In the 2016 and late 2013 we disabled the enforcement of unmet

load hours, because users were pretty new to it and were having some problems with it in understanding it. So we're going to reintroduce it for the 2019 Standard, but we've made it a little easier to comply.

So what an unmet load hour is, is the number of hours during a year when the HVAC system has more than 150 hours outside that set point in any zone. So we've set it up to where only spaces that would be enforced by the unmet load hours are spaces that are normally occupied. So the non-normally occupied spaces such as stairwells and closets, won't have that restriction on them.

The reason for this is it allows a more fair comparison with the standard design. It's more like it gets it closer to an apples-to-apples with the loads closer aligned with each other. It's currently not enforced in the alpha version. It's still reports that when a run is complete, it'll give you that screen that shows the number of unmet load hours. But for the next versions, we're proposing to have that implemented at that point.

There's a way to help a user if a design is actually designed to have a small cooling system or the software. This isn't modeling the loads as the engineer or designer did, so in the thermal zone tab we've added this add cooling system to meet load checkbox. And that'll essentially add a phantom DX cooling system in the

background to the proposed model to help it meet the load to get it below the 150 unmet load hours for that zone. This will also be reported on the PRF-01 indicating that a cooling system has been added to make sure the load -- the loads are below the 150 unmet load hours, but it will not report it as a system in the rest of the documentation.

Okay, so that's the first portion of the presentation. We'll take questions now. Anybody in the audience that has questions, we can take them now. And if there's anybody online, I don't know if Ronald -- if they're being queued up?

MR. BALNEG: (Indiscernible.)

MR. FROESS: Okay. Yeah, you can step up to the microphone and please state your name and affiliation for the record.

MR. MOHAN: Is this on? All right, thank you. This is Richie Mohan from Goodman Manufacturing. I had a quick question and perhaps a request on the CBECC-Com capability for VRF equipment. I believe at this point when we reviewed the beta version the fan consumption is a non-editable (phonetic) field? It would be appreciated if we can change that field to an editable field? I mean there are indoor units out there that have a much lower fan consumption than the default that has been put out there, which is 0.687 watts per CFM. If to represent these indoor

units perhaps more accurately, having that field changed to an editable field would perhaps be a better way to go about it.

MR. FROESS: You mean the outdoor fan power?

MR. MOHAN: The indoor unit. Yeah.

MR. HEDRICK: Is that information that would be available in the spec sheet that they would get for a unit?

MR. MOHAN: Yep, it should be. For the indoor units, of course, there's some fan consumption information that is out there.

MR. HEDRICK: Yeah, so --

(Off mic colloquy.)

MR. FROESS: Yeah, well we can take a look. We'll make a note of that and take a look at that.

MR. MOHAN: Okay. All right, and then the other question being in regards to the FSEC performance codes being used, for this capability is there a consideration from CEC for using another set of curves in the future? And if so, what would be the steps to go about for having another set of curves be perhaps proposed and then reviewed by the CEC and eventually implemented?

MR. FROESS: Yeah, that is a great question. Yeah, we are definitely open to that. We wanted to come out slow as we say with a low bar for the VRF and not give it more credit than it may be due. So we decided to go on

those Florida FSEC curves, but we are willing to look at more studies, more research of more actual monitored projects. And if they reveal that the performance is better, because we admit that we know that FSEC was an older, several year old report. And we know technologies have improved.

So if they're brought to us for review, and it meets our approval, then yeah then we can implement those in there. Yes, we're definitely open for that.

MR. MOHAN: All right. Is there a certain criteria that you're looking for, for validations of these curves in some things?

MR. FROESS: Like real world monitored studies. If there's any buildings that have been monitored, so we can get a way to see how the energy meters can crosstalk back into a performance curve? Things like that, you know, more realistic studies.

MR. MOHAN: Okay. And again, apologies for the follow up, but if you do have let's say, a validated performance curve based on an example in a building is that enough or are you looking for something which is perhaps like a bit more -- and scoped around different climate zones, different types of buildings in some things?

MR. FROESS: That would be helpful. I mean if it was just like one room in a building that was monitored

that's probably not enough. We'd want more of a wider spread or a more thorough study, maybe with some specific lab testing or even a straight several buildings that have been monitored, which I understand there are some in the works but they haven't been presented to us yet. But we're just on the side of the consumer, so we don't want to give the impression that the VRF is saving a lot of energy, but in reality their energy meters are still reporting high energy use. So we just want to be careful with it and we want to base on performance curves on reality of what they're really doing in the field.

MR. MOHAN: Okay. All right, thank you.

MR. FROESS: All right. Thank you.

If there's no one else in the room, oh (indiscernible)

MR. BUCKLEY: Liam Buckley with IES Software questions, Larry, about the phantom cooling devices. Can they independently be applied to proposed or baseline or is it one or the other or is it only on proposed?

MR. FROESS: Well, the baseline is already auto-sized to the space. I don't know if Roger or John can explain more how that's actually working internally, the phantom cooling, the DX cooling?

MR. HEDRICK: Yeah, that's just at an individual zone level, so those are zone systems that are added.

MR. BUCKLEY: Only to proposed?

MR. HEDRICK: Only to -- right. And then the baseline, of course, is sized to meet the loads by the -- sizes only.

MR. BUCKLEY: Got you. And the second question about that phantom cooling, is that an override relative to the 2016 Standards where the user could say the rated capacity of X equipment is different than what's actually in the design or is it they're both available?

MR. FROESS: I think it just adds on to it.

MR. BUCKLEY: It adds on?

MR. FROESS: So if you had a -- if EnergyPlus says you have a five -- it's a five-ton zone, but you have three-ton system installed, because you believe this really should be a three ton it'll just add on I'll just say like a two-ton DX along with it just to get it passed in that load hour hurdle.

MR. HEDRICK: Yeah, that checkbox was originally added, because we expected the designer to manually add this phantom load. And then that checkbox was to tell or report on PRF-01 that they had done that. And that's why it doesn't match up with the drawings.

MR. BUCKLEY: Will that option still be available?

MR. HEDRICK: It would. I'm not sure why you

would want to use it, though. I mean we haven't removed that checkbox, but this really makes it move.

MR. BUCKLEY: Okay. Thank you.

MR. FROESS: No one else. I think we have several people online.

MR. BALNEG: Gina Rodda from Gabel Energy is asking, "How will the ventilation space type line up with lighting space type?"

MR. FROESS: Well, I'll go back a couple of slides here. All right, so at the bottom right there on your space data tab there's a space function. That's not highlighted, but it says "office area, office plan, open office plan." When you select that, it'll try to pick the best vent function that goes along with that, but if it's not what it's supposed to be then you can click that vent function pull down and then it gives you the selections that you think it should be.

MR. HEDRICK: Yeah, so maybe more directly to your point, the space function list is based off of the lighting functions in the standards. And we need a separate ventilation function, because the list of spaces for ventilation rates is different. And so we have two separate lists: one for lighting, one for ventilation. And then we correlate them as best we can and allowed two inputs.

MR. BALNEG: Okay. We have another question from Michael Adams from Glumac. For the VRF system inputs are horizontal and vertical refrigerant pipe runs -- oh, I'm sorry -- for the VRF system inputs are horizontal and vertical refrigerant pipe runs are user input and how do they impact the performance and capacity of the system model?

MR. HEDRICK: Yeah. Those are both user inputs and there's a certain amount of degradation in performance due to long refrigerant lines horizontally as well as vertical rise between indoor and outdoor units. And so both of those, as those two lengths get longer, there will be a small performance degradation that gets applied.

MR. BALNEG: Okay, we have Matthew Friedlander. I'm going to go ahead and unmute you now. Please state your name and your affiliation.

MR. FRIEDLANDER: Hi, I'm Matthew Friedlander with RenewAire. The question I have is in regards to the fan power limits that were modeled on ASHRAE 90.1 --

MR. BALNEG: I'm sorry, Matthew. Can you speak a little bit louder? We're having a hard time hearing.

MR. FRIEDLANDER: -- with the entirety of (indiscernible) in 90.1 be reproduced?

MR. BALNEG: Hi, Matthew? Matthew, can you please repeat your question and speak a little louder?

We're having a hard time hearing.

MR. FRIEDLANDER: Now I'm doubting that you can hear me.

MR. BALNEG: Matthew, can you repeat the question please? I'm sorry, Matthew. We're having a hard time hearing you, we'll get back to you.

Next is Farhad Farahmand.

MR. FARAHMAND: Good morning. Can you hear me?

MR. BALNEG: Yes, we can. If you could speak a little bit louder, though.

MR. FARAHMAND: Sure. My name is Farhad. I'm with TRC. I have a question about the single zone air conditioner that would be applied for residential and hotel/motel guest rooms in seven or fewer floors. My understanding is that the single zone air conditioner would have a furnace heating system, which is a deviation from the ASHRAE 90.1 hot water heating system that would be served to a PTAC type of system. Wondering how the furnace was developed as the heating baseline for this space type. Thank you.

MR. FROESS: Sure. Thank you, Farhad. Yeah, the reason why is because we're trying to make the baseline match or equal to what's currently being installed out in the industry. And it seems that for seven stories or less the predominant installations are VRFs or mini-splits, not

hydronic necessarily. So that's the reason why we chose that as a system type.

MR. FARAHMAND: So VRFs and mini-splits are commonly installed in those situations. Those are served with a furnace heating system?

MR. FROESS: The baseline will be a gas furnace, yes.

MR. BALNEG: Hi, Matthew Friedlander? We're going to unmute you and we'll try it again. Go ahead.

(No audible response.)

MR. FROESS: Okay. Well, it sounds like we can't get Matthew back on here. So we're going to take a 15 minute --

MR. BALNEG: Well, we still have a couple of others.

MR. FROESS: Oh! I'm sorry. Go ahead. Okay.

MR. BALNEG: Okay. Well, he sent the question to me. So Matthew Friedlander is asking, "With regards to the fan power limits, modeled on ASHRAE 90.1, will the entirety of the Pressure Drop Allowances Table in 90.1 be reproduced specifically for energy recovery devices?

MR. ARENT: Hi. This is John. So we're basically including allowances where that feature is required for the baseline system, so things like energy recovery will not be included for the pressure drop allowance. So pressure drop

allowance is I'd have to pull up the table, but it would be for things like if extra filtration is required or possibly a ducted return, but things like heat recovery that baseline fan power will not be adjusted (indiscernible).

MR. BALNEG: Okay, we have a question from Elizabeth McCollum. Elizabeth, I'm going to be unmuting you now.

MS. MCCOLLUM: Hi. This is Elizabeth McCollum with TRC and my question is related to Farhad's and that is, well I guess it's two parts. Did you also find that four-pipe fan coils were common in high-rise multifamily buildings? And secondly, what data source did you use to determine which system types were most common in multifamily buildings?

MR. FROESS: Good question. We kind of drew the line at seven floors, because when you're using a refrigerant system like VRF normally line set lengths max out around 70 or 80 feet. So when you go beyond that generally you're going to get into sort of a centralized system with a cooling tower, maybe a water source heat pumps or other. There's really not a study. It was just asking several, I don't recall them, reached out and asked several companies what they see. And that was the answers that we were getting and so that's the reason we're basing our decision on that.

And if you have comments or reasoning why it shouldn't be please docket it and let us know the reason.

MS. MCCOLLUM: Thank you. So, sorry I have one more question again related to Farhad. So you mentioned that the baseline system for buildings up to seven stories is a gas furnace, but the common installation is a heat pump. So is there a reason for that difference, I guess?

MR. FROESS: Yeah, because we're trying to follow the ASHRAE Appendix G. Again, it's not 100 percent perfect, but generally they're always using their gas as a baseline for space heating. And so that's the reason why we've kept it that way.

MS. MCCOLLUM: Okay. Thank you.

MR. FROESS: It’s also a little more cost effective if it's a heat pump that makes the TDVs go up a little more. So it's kind of like keeping up with ASHRAE and cost effectiveness.

MS. MCCOLLUM: Great. Thanks. And we do have some data that we're willing to share related to common system types in multifamily, so I will follow up with that.

MR. FROESS: That would be wonderful. Thank you.

MR. BALNEG: Okay, we have another question from Michael Adams from Glumac. Is there going to be any added capability to model a zone system with a two or three variable speed fan -- variable feed span? Currently, it is

only constant speed unless modeled as an air system.

MR. HEDRICK: Really, that limitation came out of Energy Plus limitations and we haven't looked at whether they may have addressed those limits in more recent versions. But that's certainly something we ought to be doing even if we hadn't really thought about it, so we'll look at that, but it's -- that was an EnergyPlus limitation that we had to impose.

MR. FROESS: Okay. I think that's all the questions we have in the room and online. So we're going to take a 15 minute break just to -- just take a break. So why don't we rejoin here at 10:00 o'clock and we'll start the second half of the presentation.

(Off the record at 9:42 a.m.)

(On the record at 10:06 a.m.)

MR. FROESS: Why don't we grab a seat and we'll start this back up in a few seconds here.

MR. FROESS: Okay, welcome back. This is the -- we're going to have a continuation of the Alternative Calculation Methods Workshop. We're going to start. First, we had a late comment before the break, so we're just going to go back to a quick question slide here.

MS. WALTNER: Great. Can you hear me? Meg Waltner from ARUP on behalf of NRDC. I just wanted to comment on the HVAC system mapping and raise the concern

sort of broadly speaking that while we generally support alignment with ASHRAE we're concerned that that alignment is not in line with the state's goals for greenhouse gas emissions reduction, in particular setting a natural gas baseline for buildings that are using electricity as the fuel. And the proposed design misaligns with the emissions differences between those building types.

And what we'd like to see is similar to what we've done on the residential side, having a same fuel baseline for the proposed building. We think this will be better in line with the emissions goals of the state.

You know, and you brought up the specific example before the break about buildings less than -- high-rise residential less than seven stories and what we're seeing commonly there is VRF systems. But then we set the baseline as a single zone AC with furnace. And that that has a lower TDV, meaning that it might be harder for that VRF system to comply, even though it has lower emissions.

So I just wanted to raise that as a concern and hoping throughout the comment period we can continue to have discussions about this and make sure that the ACM is in line with the overall greenhouse gas emissions goals of the state. Thank you.

MR. STRAIT: Certainly and thank you. We definitely want to continue this conversation. As always

we are a data-driven shop, so the more data we can get on actual install figures, actual efficiency figures, the easier it is to make an argument for deviating from ASHRAE. As you know there is generally a lot of pressure for on California, when possible, to align with what the rest of the nation is doing. We have no problem taking a leadership role in dragging the rest of the nation kicking and screaming behind us, but when we do so we just need a strong data foundation for that so that it survives the anticipatable criticism.

MS. WALTNER: Okay, great. And can I add one other small detail on heat pump water heaters specifically? I wanted to flag the concern that this concern that I just raised makes it -- well, in the fact that you can't model them makes them not an option as a central system under the performance path, but also they appear to be eliminated under the prescriptive path for multifamily currently. And so that's a concern that we'd like to see addressed either through an executive director equivalency certification and/or through the ACM. So I wanted to raise that specific issue as well.

MR. STRAIT: Sure, we’re actually actively involved in the VRF discussions taking place at the federal level. We're also involved in a number of studies trying to get an accurate relationship between the rating that

this equipment receives in the lab and what the actual performance is onsite. So far we've had some difficulty in establishing that bridge, but we do anticipate by the time we actually -- by the time these regulations become effective we should have some solutions in place.

MS. WALTNER: Okay. Great.

MR. FROESS: And to comment on the central electric water heating, we are also working a path to have a means to model electric water heating. There's a study actually going on now for central heat pump water heating systems that may take the rest of this year to get it done. But in the interim, we may come up with a solution to help with that.

MS. WALTNER: Okay. Great, thank you very much.

MR. FROESS: Okay. So the next items are the updates for the covered process.

There's been two new sections added to the 2019 Standards. One is for the fume hood automatic sash controls per sections 140.9(c)(4). (phonetic) Essentially, this makes the standard design have automatic sash controls that will vary the amount of exhaust going out of these hoods that would save energy. So there's certain criteria that would trigger this and when it does the baseline would become -- would model this sash control feature and with a VAV exhaust fan, saving energy in the

design.

And also, for the laboratory and factory exhaust systems there are credits or requirements for that. You have anemometer control, containment control and exhaust treatment. We only modeled the exhaust treatment devices in the software. I'm looking at John, sorry.

MR. ARENT: Yeah, so the treatment devices there's an additional fan power allowance for that. And then as far as the control options there are ways to specify or indicate that you have either an anemometer-based control or a contaminant-based control, but those aren't explicitly modeled, but they're given equivalence to the prescriptive requirements.

MR. FROESS: So they allow you to select, give you no credit and no penalty, but as long as your design shows them in there you're allowed to use that.

MR. STRAIT: Thank you.

MR. FROESS: Water heating is the next change. Service hot water, which is for nonresidential spaces, you can now define them as having gas or electric. A change that we made in the standard design now is also aligning with ASHRAE 90.1 Appendix G, is that some space types will have a gas-fired water heater in the baseline and some will have electric. It is generally based on spaces that would have low hot water demand such as like an office or retail

that would have an electric hot water as the baseline. Spaces such as kitchens and laundromats that have a high hot water usage, those would have a gas hot water in their standard design.

And the software will size itself in the standard design based on the total hot water loads of the spaces and it'll size the capacity of the hot water systems, but it will go no lower than the 30-gallon storage. And that's all done automatically.

Healthcare facilities are also required to comply with the new water heating requirement.

High-rise residential, we've done this is 2016, but we're just explaining it again is now that for high-rise residential we've imported the residential California Simulation Engine, CSE. That's what actually calculates the hot water distribution losses and energy use of hot water in low-rise multifamily, so we just imported this into high-rise res. So the energy use of the hot water should be darn close, equal to low-rise and high-rise.

We've also, because of that the residential multifamily allows the installation of an electric water heater when you have an individual water heater per dwelling unit that could be a heat pump water heater that you install. When you do that the standard design will switch to a 2.0 UEF heat pump water heater along with a

basic compact hot water distribution and a drain water heat recovery system.

So this would allow basically an all-electric multifamily high-rise residential -- not all electric, I'm sorry -- you still have the gas space heating. But you can get the hot water heating to be all electric. And you don't have to actually install the basic compact water distribution or drain water if you just get a NEEA-rated Tier 3 heat pump water heater. That essentially equates to that same -- the same baseline that's being created there.

For central electric water heating as a commenter mentioned before it's still going to use a gas water heater for that system. And that's one when you have a recirculation loop and when there are more than eight dwelling units together.

There's the compact hot water distribution systems has two types to it. There's a basic and enhanced. These are both used for credits. And so the basic is a non-HERS verified version of it. And if you want to go to the enhanced that will give you the full credit of the compact hot water distribution system.

And the drain water heat recovery system, that's where you have essentially your shower drains tie into a heat recovery system. That also can be used for credit and would require HERS verification.

So just to cover just a couple of miscellaneous items, speaking of the field verifications for the first time in CBECC-Com when you model high-rise res, there's now mandatory HERS verifications for the IEQ ventilation, for the air flow. And also there's kitchen hoods; those have to also be HERS verified.

The optional credits that can be modeled for credit is enhanced compact hot water distribution and the drain water heat recovery systems.

So our thought is, or the plan is before the final version is released is that we're going to have the software produced in what we call a bees.xml (phonetic) file similar to how residential does it. And that would be used to upload to providers, residential providers. And that would give you a watermarked PERF report until it goes through the HERS providers and gets registered. So that's still in the works. The current alpha version does not reflect that.

We're also proposing to have CBECC-Com engine update and it's not in this current alpha version, but in the next one we're going to upgrade the OpenStudio to the current version or the latest version, which is 2.7. And along that we'll go to EnergyPlus version 9.01. And this will bring some benefits, because there's been bug fixes and some feature enhancements brought to those versions.

And moving forward with CBECC we can tap into those new features and improve the software as we go forward.

A couple of things to point out about the reporting is the onscreen energy use summaries are accurate in the alpha versions, but we haven't dedicated resources and time to get the .pdf version, the PRF-01 Report as accurate as it would need to be for this version. We'll wait until the final certified version before that gets perfected along with the software.

And this, here's a quick timeline of where we're looking at. So we released this alpha version for the public workshop in January of 2019. All of the materials were posted, I think on January 28th or so. We're going to work on a release candidate, which is what will be proposed to the Commission to be used for the certified version. That'll be released in April and again that will be posted for the public to review as well. And at that point we hope to have the CBECC-Com engine upgrades in there as well as an unmet load hour implementation.

Once it's presented for approval to the Commission and it does get approved, then it'll become the 1.0, 2019 1.0 which will be the certified version. That will have the .pdf version of the PERF-01 corrected and aligned to it. And that should be released in May. That's our plan so far.

That's pretty much the end of this presentation. We strongly encourage submitting written comments to our docket. We would like to leave it open for real consideration of comments by March 1st, 2019. It'll still be open afterwards, but the later something gets submitted the less priority it may have. And the information is on the screen there.

(Off mic colloquy.)

MR. FROESS: Okay. I went out of order. We'll take questions on whatever we've presented today and then we'll have a final comment.

MR. BALNEG: We have a question from George Nesbitt. George, I'm going to unmute you right now.

MR. NESBITT: Yeah. Can you hear me?

MR. BALNEG: Yeah. Go ahead.

MR. NESBITT: Yeah, just a couple of questions and then also some comments. You just mentioned on the multifamily high-rise that you're using the actual water heating module from CBECC-Res. And I'm wondering on the issue of ventilation and lighting since those all also follow the same residential rules, how that's implemented? Is that implemented the same or did you have to recreate that in CBECC-Com? That's a question.

MR. FROESS: Yeah, the lighting is the same as it has been having us locked in at a half-a-watt per square

foot. And that doesn't have anything to do with the residential CSE. That's just fixed into the software and that's not unchangeable. It's just strictly the water heating portion is what's being used from the residential CSE.

MR. NESBITT: Okay. Because I mean the residential lighting basically requires all high efficacy, but all right.

MR. FROESS: Yeah. Those are all mandatory requirements. I'm sorry to interrupt you, those are mandatory requirements, so that's not really software controlled.

MR. NESBITT: Well, then I guess if you're providing an energy budget of watts per square foot even though it's a mandatory are you able to get credit by being more efficient or do you get penalized for being less efficient, because that's not available in low-rise residential.

MR. FROESS: Yeah, it's the same thing with the high-rise residential dwelling units. There's no input for it and it's just neutral for the baseline proposed. But for nonresidential spaces, of course, you model your lighting.

MR. NESBITT: Okay. And then I think somewhere I remember seeing reference that perhaps for nonres you were

going to allow non-CBECC engine software. Is that true and is there any?

MR. FROESS: Yes. For the 2019 Alternative Calculation Methods Approval Manual we have opened it up for any third-party vendor to come through with their own compliance engine to be certified as a Title 24 compliant software.

MR. NESBITT: Okay. I mean I've been a very big supporter of the Energy Commission's core calculation engines, because I believe if you put the same inputs into a piece of software you should get the same result. And historically, that was not true in residential with Micropath and EnergyPro.

So that’s just a comment and so I think a couple -- sort of a missed opportunity with CBECC-Res and nonres is the ability to run a project as either a residential or as a nonresidential. That's something that you could always do in EnergyPro. And to me it just seems that the development of the two should be compatible and there are reasons you might have to go back and forth between the two.

And then, I just wanted to comment on sort of the issue of baselines, and people brought up going to a gas baseline for residential units in like I guess seven story and less buildings. I think the Energy Commission has to -

- I guess it really comes down to is are we trying to establish what an energy efficient building should be or are we going to establish that based on what the market does? And because the market does this or that do we allow them to use more energy or not versus you know, let's establish what an energy efficient building should be. And you choose how you deliver it and suffer the consequences. Or how you build versus -- you know, instead of accommodating you, because you use more energy intensive systems therefore you've got to use more energy.

So I'd just comment on that. And that's it, I guess,

MR. FROESS: Okay thank you for the comments, George. We'll take those into consideration.

MR. NESBITT: Great.

MR. BALNEG: Okay, we have a question from Elizabeth McCollum from TRC. How are you defining compact distribution? Is it identical to residential or tailored for multifamily?

MR. FROESS: It’s identical to how it's being done in residential, because that's part of the CSE implementation of into com. (phonetic) So the residential CSE (indiscernible) is modeling the compact water distribution as well as the drain water heat recovery devices.

MR. BALNEG: Okay, and then we have Matthew Friedlander. I'm going to go ahead and unmute you now. Hi, Matthew, are you there?

MR. FRIEDLANDER: Hi, this is Matthew with RenewAire. Can you hear me now?

MR. BALNEG: Yes. Go ahead.

MR. FROESS: Yes.

MR. FRIEDLANDER: Sorry, I apologize if you discussed this question while I was unable to hear. It relates to the fan power limits that were taken from ASHRAE 90.1. And my question is whether you're incorporating the entirety of the table of pressure drop allowances. You showed some on the screen, but not all of them.

MR. ARENT: Yeah, this is John Arent of NORESCO. So what we're doing we are essentially aligning with the ASHRAE fan power limits, however we're not incorporating all of the adjustments that ASHRAE has. And the reason is, or the principle is, that we're only including the allowance if there is a corresponding requirement in the standards for a particular feature or device. So for example, for things like energy recovery you would not get an additional allowance for energy recovery on the pressure drop if it's not required in code. And since it's not required we're not including that in the allowance.

MR. FRIEDLANDER: Is there a way that if the

designer can show that in their particular application energy recovery would be appropriate, that additional fan power can be provided?

MR. ARENT: Well, I mean it's certainly allowed. You know, all these features are allowed. I think the thought is that if one of these features is provided that you would presumably get some energy benefits and load reduction that would offset the slight increase in fan power requirement.

MR. FRIEDLANDER: Okay, and so that would show up in your modeling compared to this baseline modeling.

MR. ARENT: Right. So it would depend on the circumstances and the individual building model, but it's quite possible that a building with energy or a system with energy recovery that has a fan power slightly higher than the baseline could perform better overall. It would depend on how that washes out in the actual energy simulation.

MR. FRIEDLANDER: Thank you very much.

MR. BALNEG: We have one more question from Michael Adams from Glumac. Is the ability to model a noncompliance energy simulation being considered to be added to the CBECC-Com platform that allows user input for building schedules? This is beneficial for various utility-based incentive programs.

MR. FROESS: Yeah, not at this time. We

understand what you're saying, but not at this time. The reason could be is that how would it be verified in the field easily. So by having fixed curves and schedules, it kind of eliminates that variability of enforcement.

MR. STRAIT: Actually, I can --

(Off mic colloquy.)

MR. STRAIT: Yeah, I can add to that. That we do get some requests for folks that do want to use the software for programs outside of compliance verification for Part 6. We do look at those, but unfortunately we do tend to need -- necessarily to prioritize those under the work that we do to improve the model for compliance purposes. So certainly we're aware of that request, that that could be useful for utility programs to layer on top of the modeling some different usages assumptions, again for verification on their programs. The software is open source, so they are able to look under the hood and make those modifications themselves for a version that they might use for their programs. But it's not something that we are typically able to dedicate state resources to do at this point.

MR. FROESS: Okay, we have one more in-person comment.

MS. WALTNER: Hi, Meg Waltner from ARUP on behalf of NRDC. I just wanted to make a follow up comment on

water heating and emphasize -- well, say first that we're supportive of the inclusion of the individual heat pump water heaters for multifamily and think that's a great step forward. But just to emphasize the point we made earlier that we do still see the predominant system type for larger multifamily buildings as being a central hot water system. And the importance of being able to both model under the performance path and comply prescriptively using a central heat pump water heater. So I just wanted to emphasize that point again. Thanks.

MR. FROESS: Thank you.

Okay, I think that's all the comments that we have in person and online. I think we have one more comment from Christopher Meyer who is the Building Standards Office Manager.

MR. MEYER: Oh, hello everyone. I sort of wanted to say thank you to staff for putting on a very clear presentation and for all the people who traveled out here to provide comments, those on the phone and the computer as well. And all the people who supported the Standards Office over the last several years to get to this point, so that we're getting closer to another code cycle.

Commissioner McAllister was not able to join us, but he wanted to send his support as well. Also to emphasize his commitment and staff's commitment to making

sure that we have a product, a software product, that really is helping people comply with the standards. You know, that we provided tools that allow easy, clear, simple methods to comply with the standards. Because as you can imagine it doesn't do a lot of good to spend three years working on very well thought-out standards that are not easy to comply with or not easy for people to even know whether they comply with them. So that's sort of our ongoing commitment to making compliance with the standards as simple as possible and to give options to designers to have good buildings that meet the overall goals of California.

And as many of you have heard, looking forward to the 2022 cycle we're going to be putting the emphasis and work into nonresidential and multifamily that we have been putting into single family and low-rise residential in previous cycles. So stick with us over the next several years. We're going to be putting a lot of work into nonresidential and multifamily in our standards.

So we appreciate all your help in working with us to move those standards forward. Thank you.

MR. FROESS: Thank you, Christopher.

So again, I'd like to thank everyone for attending and commenting and please try to get us comments by March 1st, the sooner the better. That'll help us, keep

us on the priority list for considerations of any changes that we need to make to the software. Thank you very much.

(The workshop was adjourned at 10:32 a.m.)